

Application No.: 09/848,794
Amendment Dated October 30, 2007
Reply to Official Action of May 15, 2007

REMARKS/ARGUMENTS

This Reply is being filed in response to a first Official Action following a Request for Continued Examination (RCE) of the above-identified application. The Official Action indicates that the claims are no longer rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. However, the Official Action continues to reject all of the pending claims, namely Claims 1-5 and 11-15, under 35 U.S.C. § 102(e) as being anticipated by US Patent Application Publication No. 2004/0146014 to Hammons, Jr. et al. As explained below, contrary to the allegations of the Official Action, Applicant respectfully submits that the claimed invention is patentably distinct from Hammonds and, accordingly, traverses this rejection of the claims. In view of the remarks presented herein, Applicant respectfully requests reconsideration and allowance of all of the pending claims of the present application.

As previously noted, Hammons discloses a system and method for designing space-time codes to achieve full spatial diversity over fading channels. As disclosed, the system and method present general binary design criteria for phase shift keying or PSK-modulated space-time codes. In this regard, design criterion may include, for linear binary phase-shift keying (PSK) (BPSK) codes and quadrature PSK (QPSK) codes, the rank (i.e., binary projections) of the unmodulated code words, as binary matrices over the binary field.

According to one aspect of the claimed invention, as embodied in independent Claim 1, an apparatus is provided for a communication system in which space-time encoded data is transmitted at a first location and at least at a second location for communication to a receive station. As recited, the apparatus includes a decoder coupled to receive indications of received values of the space-time encoded data received at the receive station. The decoder is also for directly combining the received values of the space-time encoded data transmitted from different ones of the first and at least second locations to the receive station. Once directly combined, the received values of the space-time encoded data form a real-valued vector, free of imaginary component parts. The decoder may then further be for detecting values of symbols of which the space-time encoded data is formed, based upon the real-valued vector into which the received values are directly combined.

Application No.: 09/848,794
Amendment Dated October 30, 2007
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As explained in response to a final Official Action, in contrast to independent Claim 1, Hammons does not teach or suggest a decoder for directly combining received values of space-time encoded data such that the combined values form a real-valued vector free of imaginary component parts, and for detecting values of symbols of which the space-time encoded data is formed, based upon the real-valued vector into which the received values are directly combined. Hammons does briefly disclose a space-time decoder for decoding space-time codes. Hammons does not, however, disclose the manner by which the decoder decodes those codes, much less in a manner corresponding to that of amended independent Claim 1. Instead, as indicated above, Hammons is concerned with the design of space-time codes for multi-antenna communication systems. In fact, Hammons explicitly states that, “[t]he present invention is concerned primarily with the design of space-time codes rather than the signal processing required to decode them. In most cases, the decoding employs known signal processing used for maximum likelihood reception.” Hammons, paragraph 56.

In response to the foregoing, the first Official Action of this RCE maintains that Hammons discloses the aforementioned features of the claimed invention, and cites to paragraphs [0010] – [0015], including equations (1) and (2), as support. That is, the Official Action alleges that equations (1) and (2) disclose a model of the received signal and its matrix equivalent, respectively, and that the model is a real-valued vector, free of imaginary component parts, as recited by the claimed invention. Applicant respectfully disagrees.

As disclosed, equation (1) of Hammons is expressed as follows:

$$y_t^j = \sum_{i=1}^{L_t} \alpha_{ij} s_t^i \sqrt{E_s} + n_t^j, \quad (1)$$

where “ α_{ij} is the complex path gain from transmit antenna i to receive antenna j ” Hammonds, paragraphs [0010] – [0011] (emphasis added). And as also disclosed “[t]he noise samples [n_t^j] are independent samples of a zero-mean complex Gaussian random variable with variance $N_0/2$ per dimension.” *Id.* (emphasis added). Contrary to the allegations of the Official Action, and to the claimed invention, Hammons quite clearly discloses that at least the variables α_{ij} and n_t^j are complex, and as such, the received signal y_t^j is also complex.

Application No.: 09/848,794
Amendment Dated October 30, 2007
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Equation (2) of Hammonds, the matrix equivalent of equation (1), is expressed as follows:

$$\bar{Y} = \sqrt{E_s} \bar{A} D_c + \bar{N} \quad (2)$$

where

$$\begin{aligned}\bar{Y} &= \left[y_1^1 y_2^1 \dots y_n^1 y_1^2 y_2^2 \dots y_n^2 \dots y_1^{L_r} y_2^{L_r} \dots y_n^{L_r} \right], \\ \bar{N} &= \left[n_1^1 n_2^1 \dots n_n^1 n_1^2 n_2^2 \dots n_n^2 \dots n_1^{L_r} n_2^{L_r} \dots n_n^{L_r} \right], \\ \bar{A} &= \left[\alpha_{11} \alpha_{21} \dots \alpha_{L_r 1} \alpha_{12} \alpha_{22} \dots \alpha_{L_r 2} \dots \alpha_{1L_r} \alpha_{2L_r} \dots \alpha_{L_r L_r} \right], \\ D_c &= \begin{bmatrix} f(c) & 0 & \cdots & 0 \\ 0 & f(c) & \cdots & 0 \\ \vdots & \ddots & \ddots & 0 \\ 0 & 0 & \cdots & f(c) \end{bmatrix}_{L_r L_r \times L_r n}\end{aligned}$$

As shown, at least matrices \bar{N} and \bar{A} of \bar{Y} include complex variables n_t^j and α_{ij} , respectively. Similar to equation (1), and contrary to the claimed invention, then, the matrix-equivalent of received signal \bar{Y} is also complex.

Applicant therefore respectfully submits that independent Claim 1, and by dependency Claims 2-5, is patentably distinct from Hammons. Applicant also respectfully submits that independent Claim 11 recites subject matter similar to that of independent Claim 1, including the aforementioned decoding features. As such, Applicant respectfully submits that independent Claim 11, and by dependency Claims 12-15, is also patentably distinct from Hammons, for at least the same reasons given above with respect to independent Claim 1.

For at least the foregoing reasons, Applicant respectfully submits that the rejection of all of the pending claims as being anticipated by Hammons is overcome.

Application No.: 09/848,794
Amendment Dated October 30, 2007
Reply to Official Action of May 15, 2007

CONCLUSION

In view of the remarks presented above, Applicant respectfully submits that the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicant's undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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